

**NTM 51-10-32 / ANDT 51-94-23: New general
chapter for UT inspection of metallic structures**

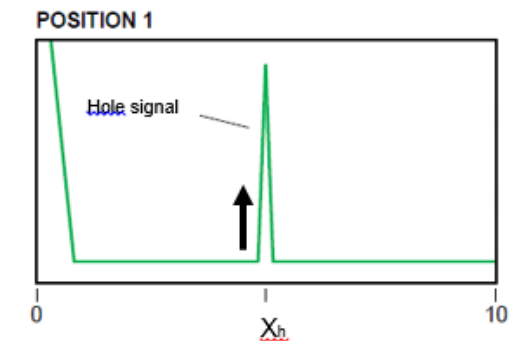
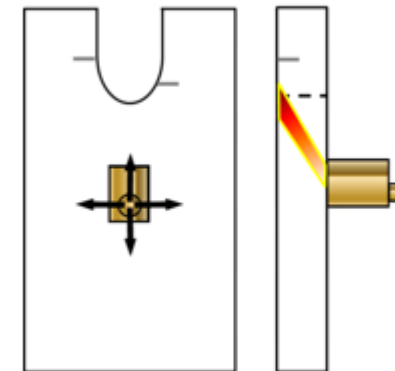
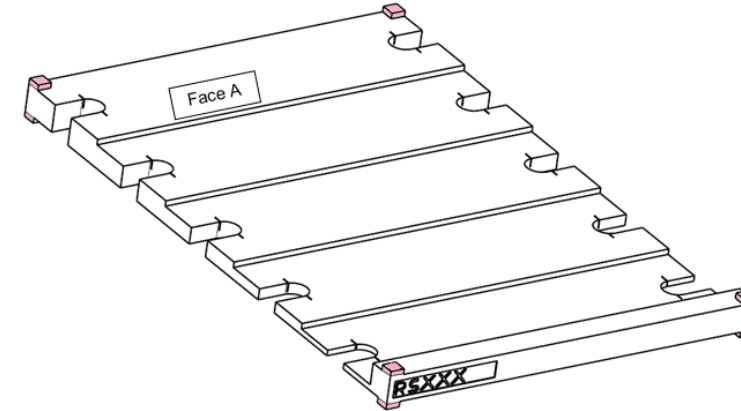
62nd Annual A4A NDT Forum, Long Beach, LA (CA)

Alfredo RODRÍGUEZ-ÁLVAREZ
Head of Engineering NDT In-Service
17th September 2019

AIRBUS

Contents

- Introduction
- Current UT inspections in CH51 and NDT manuals
- New NTM 51-10-32 / ANDT 51-94-23
- Conclusions
- Outlook into the future



Introduction

Introduction

Current UT Shear waves inspection tasks

- Reference to general chapter NTM 51-10-13 / ANDT 51-94-20 or NTM 51-10-15 / ANDT 51-94-21
- New specific procedure (new settings, specific calibration blocks)

Limitations

- Short thickness range
- Different ways of adjustment and inspection in same NDT manual
- Increasing amount of new calibration blocks

Objective: New NTM 51-10-32 / ANDT 51-94-23

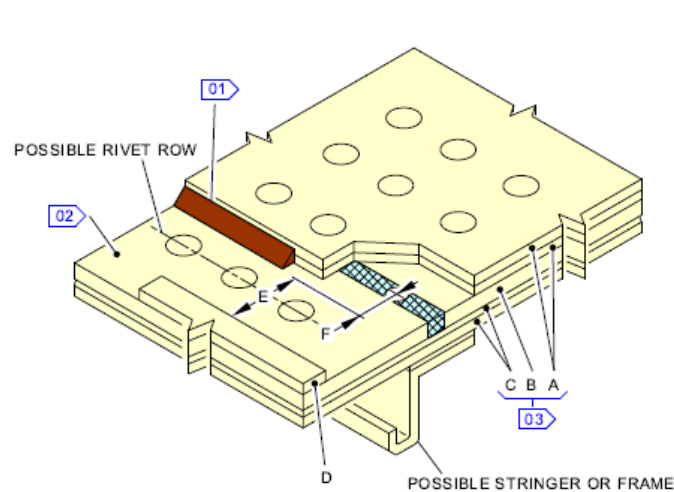
- Develop a single way of working and inspection that could be applied to most inspection areas
- Overcoming the current thickness limitations
- Introducing a new “All-in-One” calibration block

Current UT inspections in CH51 and NDT manuals

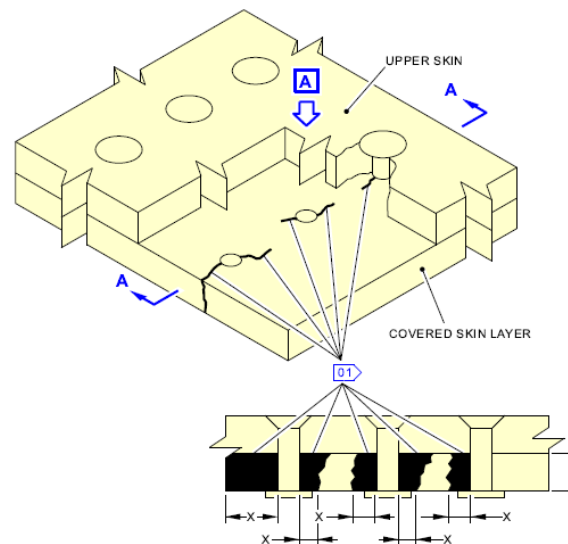
Current UT inspections in CH51

NTM 51-10-13 / ANDT 51-94-20: Inspection for through cracks in multi-layered joint structures (AI)

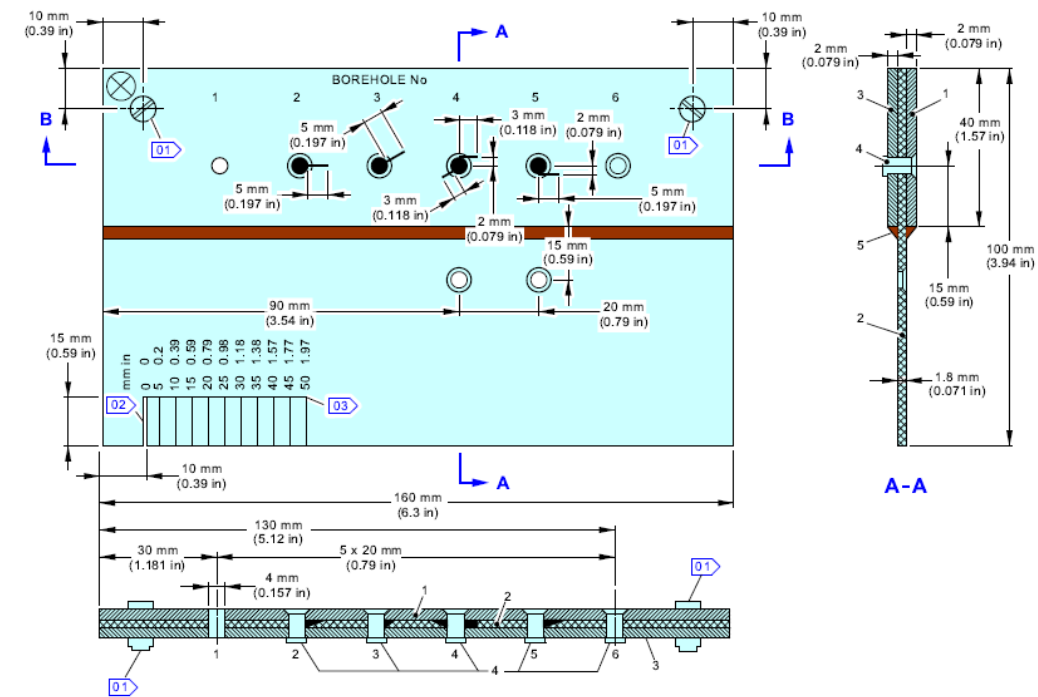
- Thickness range: 1.0 mm (0.039 in.) – 4.0 mm (0.157 in.)
- Possible damage: through fatigue cracks
- UT Shear waves multiple skips
- Sensitivity adjustment done on rivet hole within inspection area



Inspection area



Possible Damage

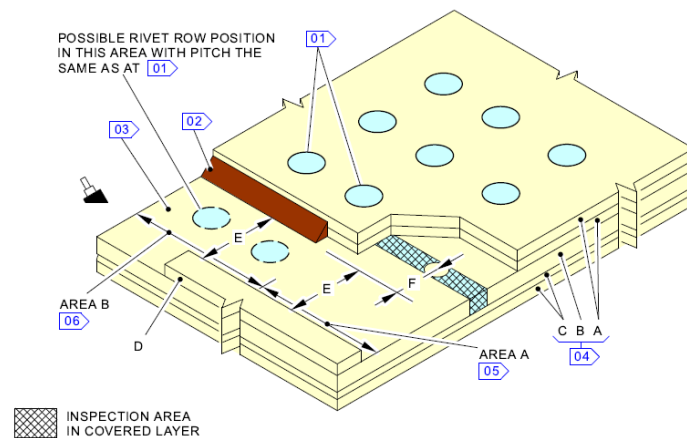


Reference Block
99A51107299001

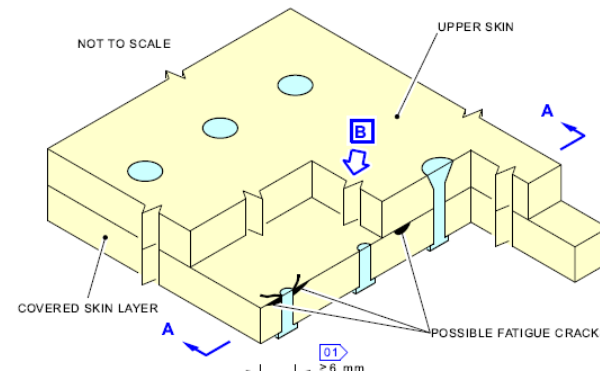
Current UT inspections in CH51

NTM 51-10-15 / ANDT 51-94-21: Inspection for shallow cracks in multi-layered joint structures (AI)

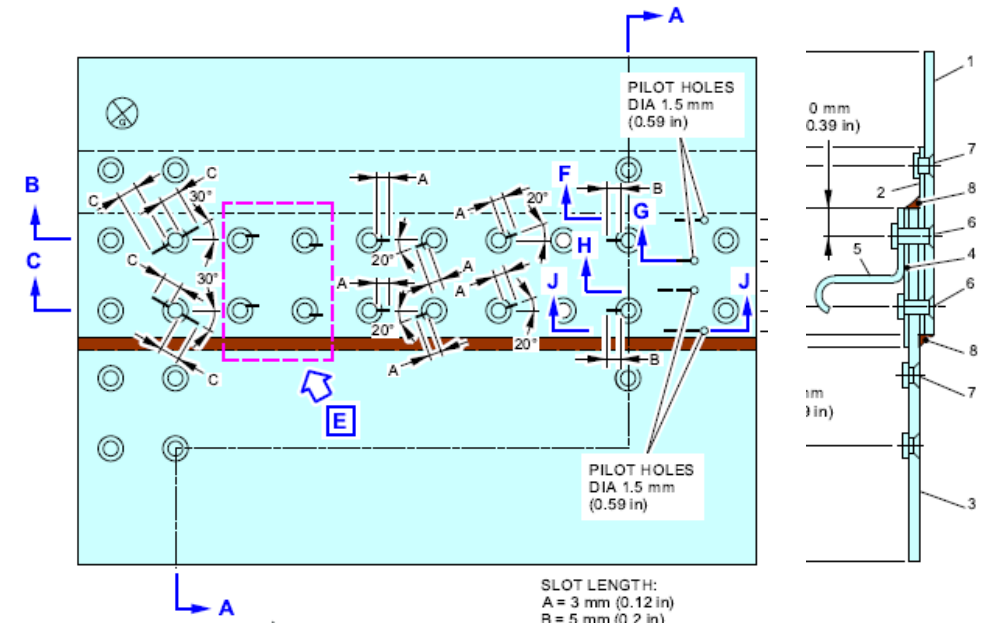
- Thickness range: 1.0 mm (0.039 in.) – 4.0 mm (0.157 in.)
- Possible damage: shallow fatigue cracks
- UT Shear waves multiple skips
- Sensitivity adjustment done on rivet hole within inspection area



Inspection area



Possible Damage

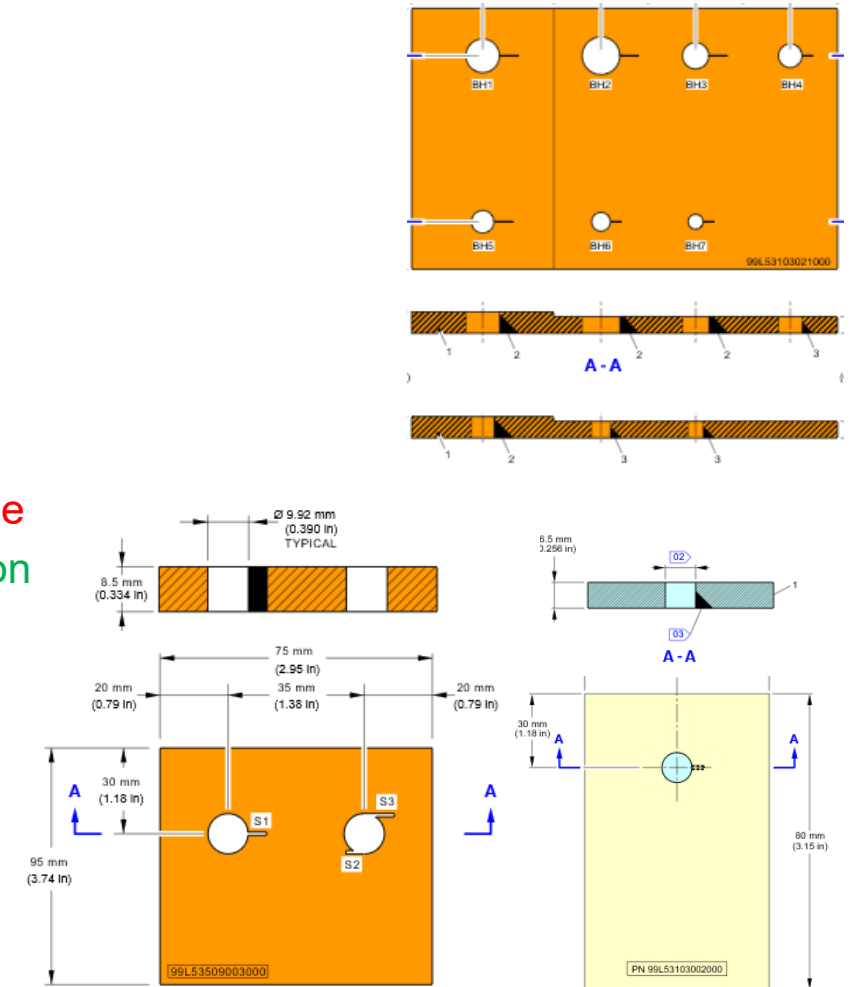


Reference Block
99A53307292001

Current UT inspections in NDT manuals

Several UT shear waves inspections tasks

- Different and wider thickness ranges
- Possible damage: through and shallow fatigue cracks
- Different ways of adjustment and inspection
 - Sensitivity adjustment on the rivet hole to be inspected
 - Inspection is not homogenous as gain values differ at each rivet hole
 - + Operator does not need specific Reference block, just Familiarization
 - Sensitivity adjustment on artificial EDM notch
 - + Homogenous and harmonized inspection
 - More complex Reference block required
- Lots of calibration and reference blocks



Current UT inspections in CH51 and NDT manuals

Limitations

- Creation of new specific procedures – longer lead times and less customer friendly
- Short thickness range

Objective is to extend range until 20.0 mm (0.786 in.)

- Different ways of adjustment and inspection in same NDT manual

Objective is to define a more harmonized way of working

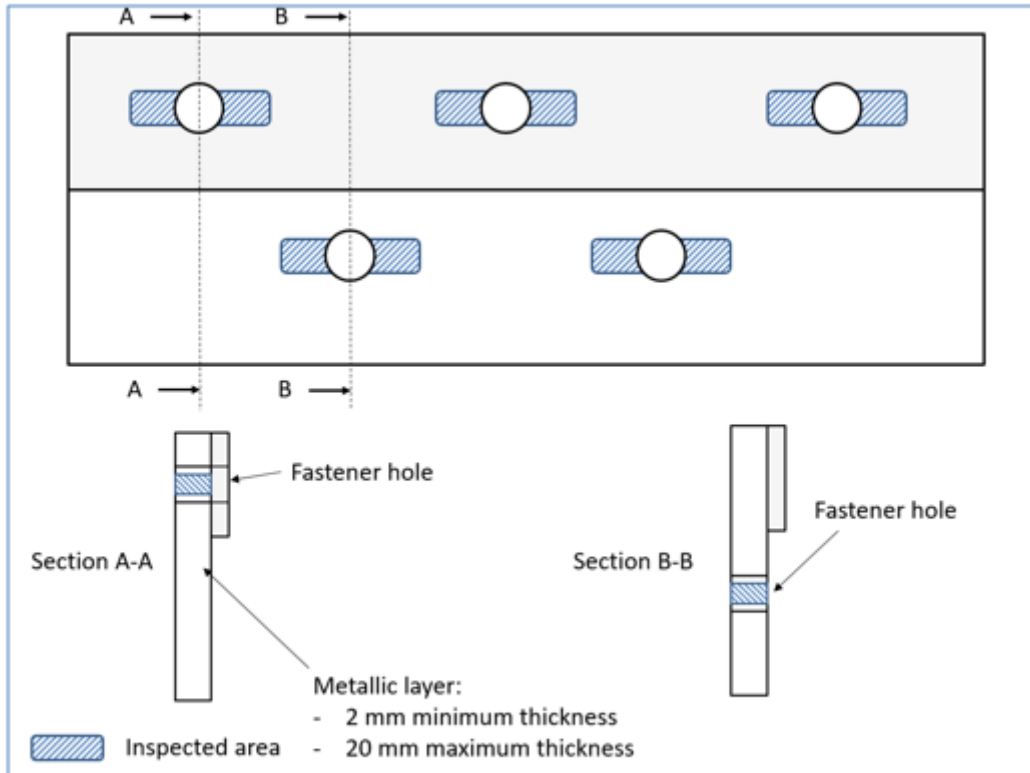
- Increasing amount of new calibration blocks

Objective is to stop to design slightly different CBs and to create an “All-in-One” CB

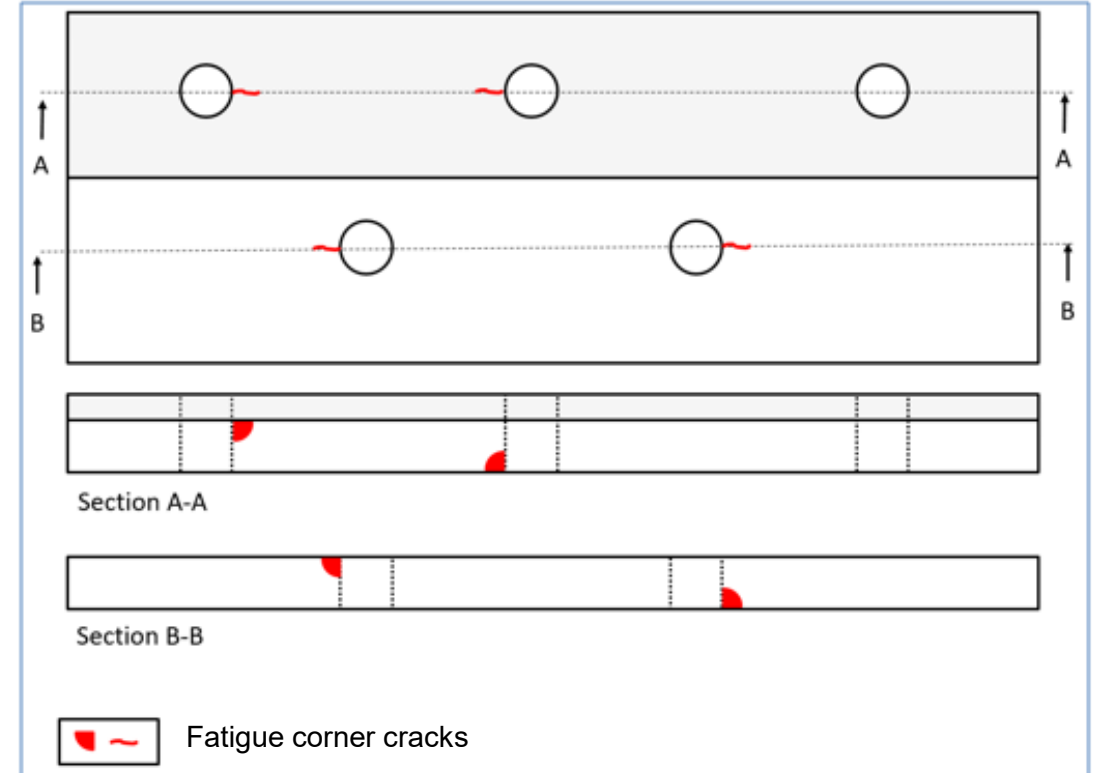
New NTM 51-10-32 / ANDT 51-94-32

New NTM 51-10-32 / ANDT 51-94-23

• Description and applicability



Structure build-up and Inspection area in one layer and multi-layered joint

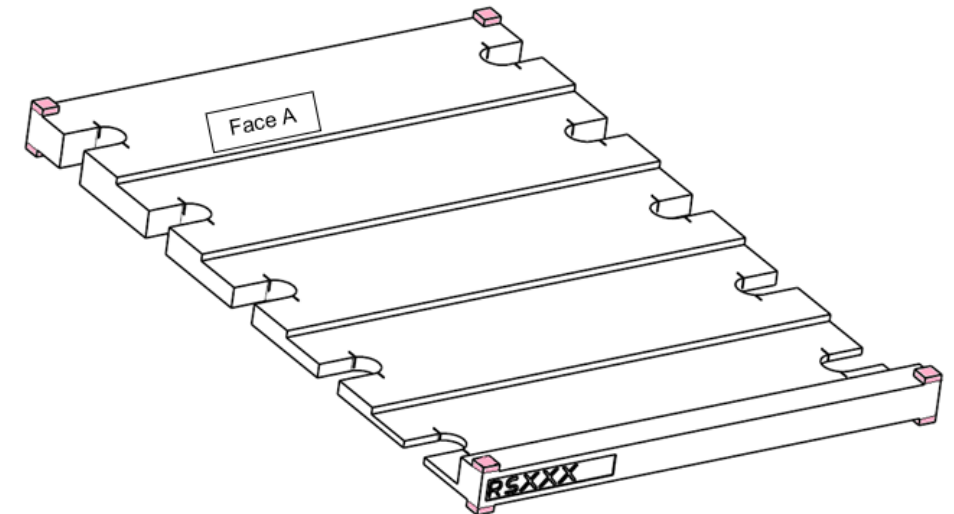
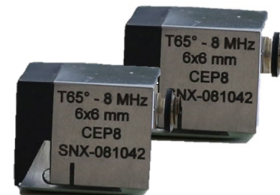


Possible damage

New NTM 51-10-32 / ANDT 51-94-23

- Equipment used

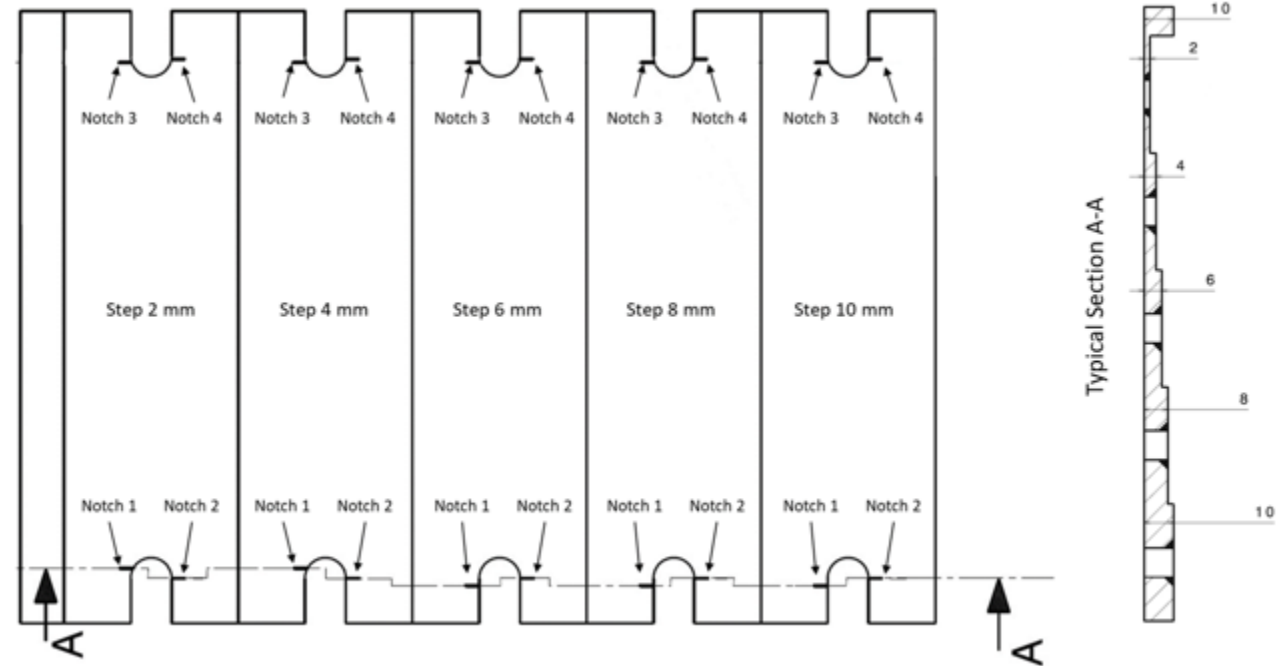
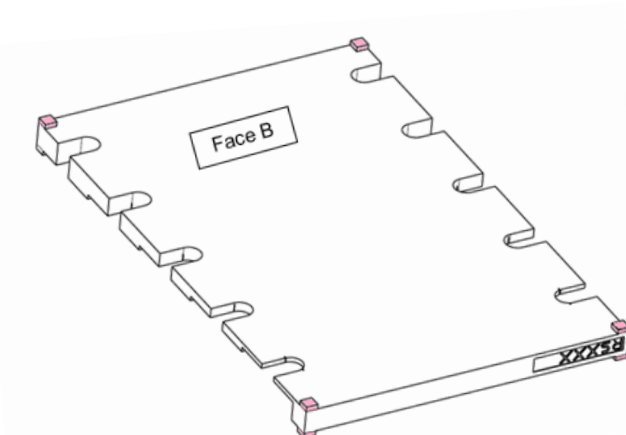
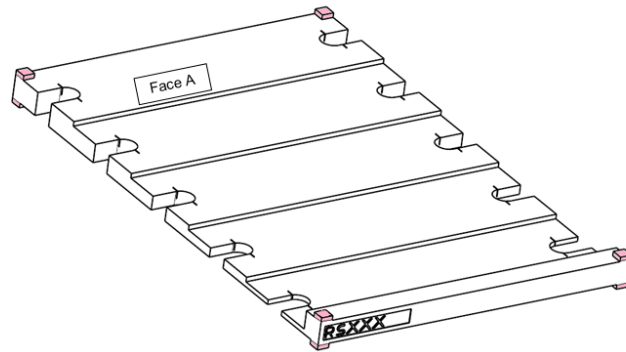
REFERENCE	DESIGNATION
SMART UE1	Ultrasonic equipment
CEP18	8 MHz, 45° Shear wave search unit
CEP21	8 MHz, 60° Shear wave search unit
CEP23	8 MHz, 70° Shear wave search unit
99N51109009000	Calibration block
99N51109010000	Calibration block



Technical Qualification only done for CEP18, CEP21 and CEP23 search units

New NTM 51-10-32 / ANDT 51-94-23

- Calibration blocks PN9951109009000 and PN9951109010000



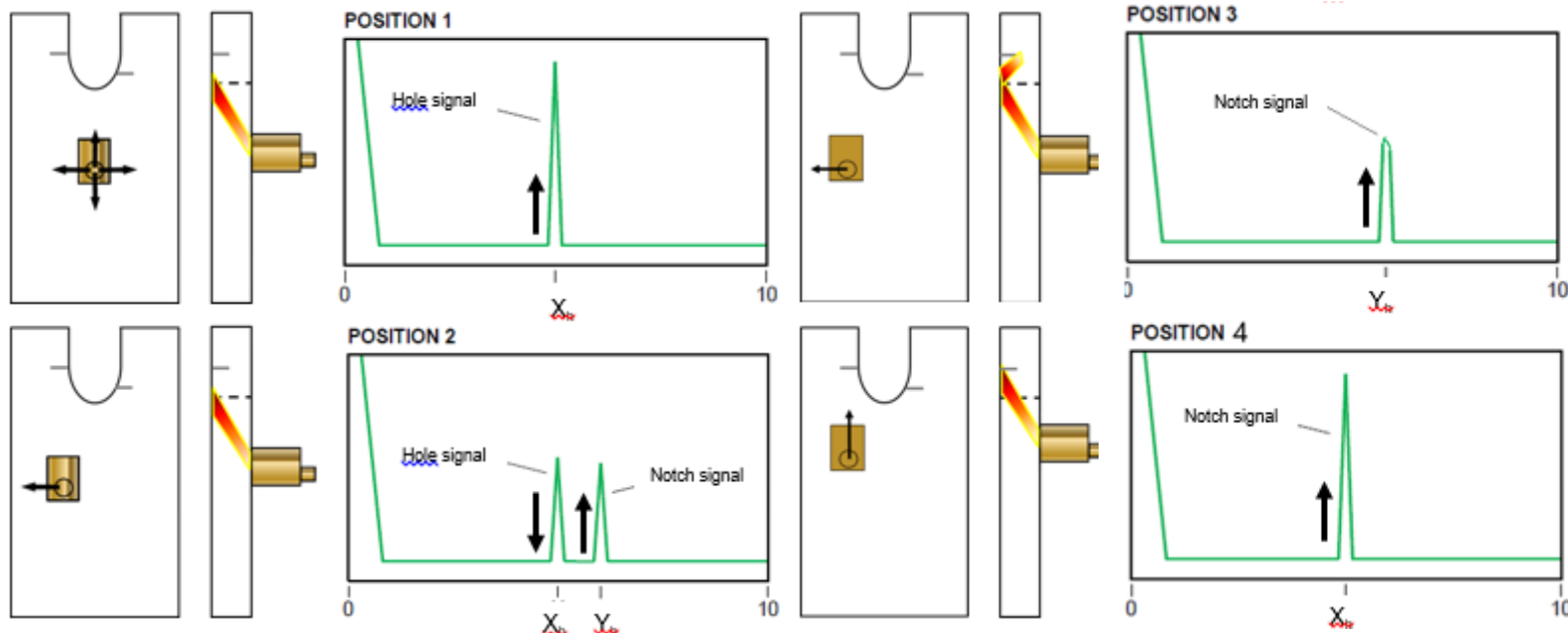
Hole diameter simulated (mm)																			
Step thickness 2 mm				Step thickness 4 mm				Step thickness 6 mm				Step thickness 8 mm				Step thickness 10 mm			
N1	N2	N3	N4	N1	N2	N3	N4	N1	N2	N3	N4	N1	N2	N3	N4	N1	N2	N3	N4
4,8	9,4	6,4	8,0	4,8	9,4	6,4	8,0	12,8	9,4	6,4	8,0	12,8	9,4	6,4	8,0	12,8	9,4	6,4	8,0

New NTM 51-10-32 / ANDT 51-94-23

• Instrument adjustment

- Use of calibration block allowing familiarization with change-over pattern and sensitivity adjustment on EDM notch
- Use of half-skip or full skip

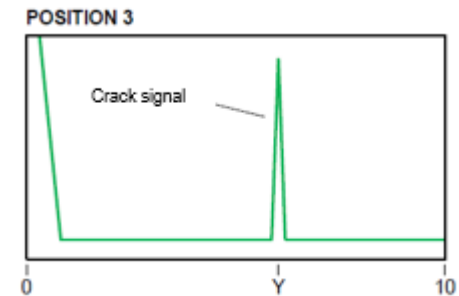
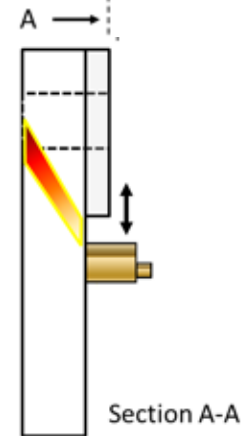
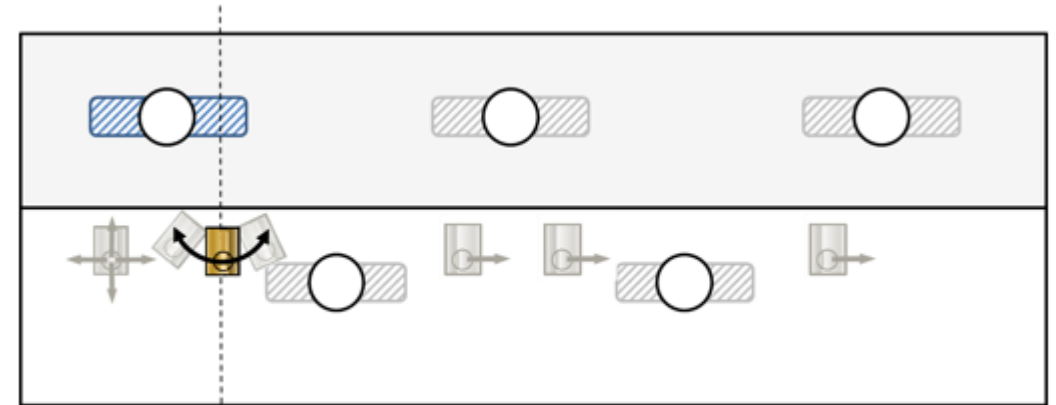
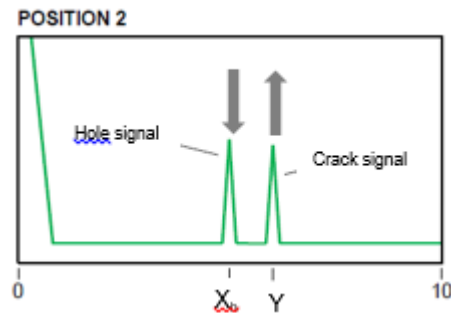
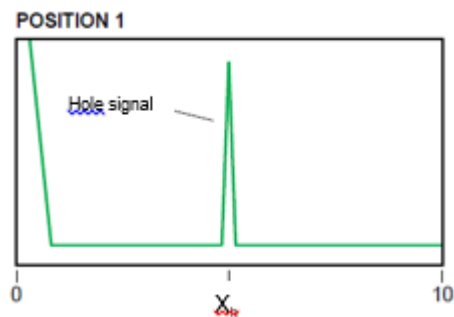
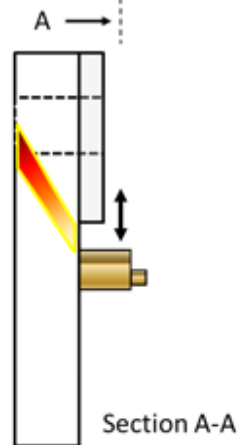
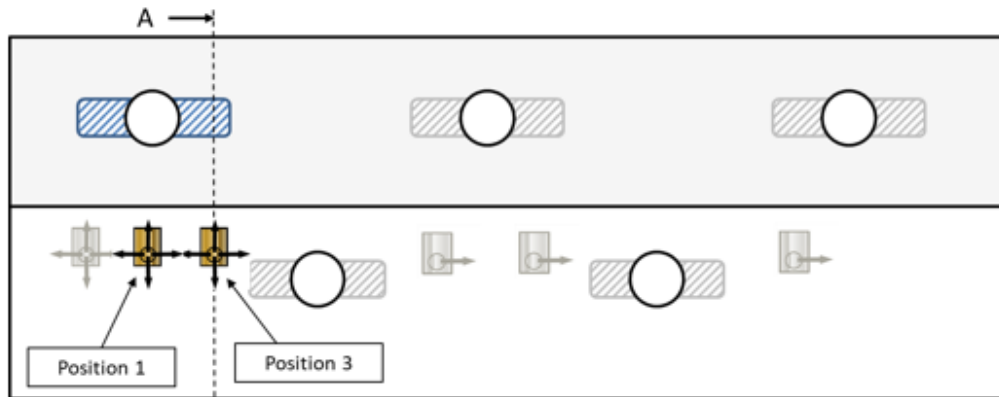
Thickness (mm)	Search unit	Refracted angle (°)
2	CEP 23	70
4	CEP 23	70
6	CEP 23	70
8	CEP 21	60
10	CEP 21	60
12	CEP 21	60
14	CEP 21	60
16	CEP 21	60
18	CEP 18	45
20	CEP 18	45



New NTM 51-10-32 / ANDT 51-94-23

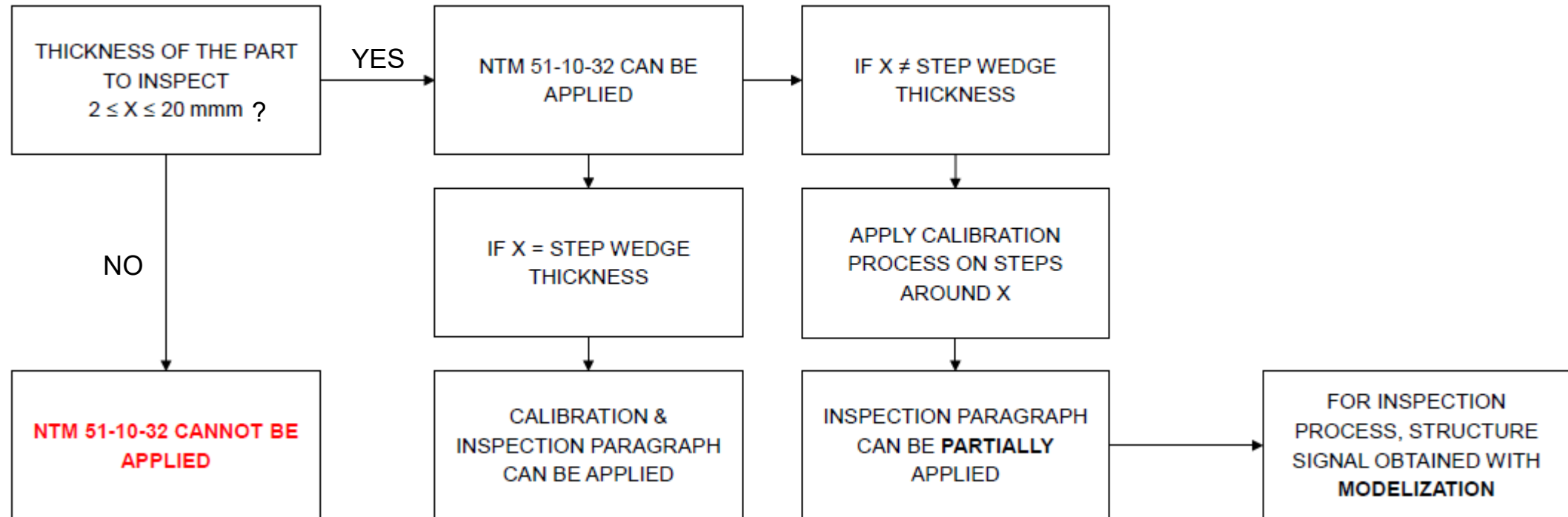
• Inspection

- Key factor: Transfer correction between calibration block and real structure to be considered



New NTM 51-10-32 / ANDT 51-94-23

- Inspection and applicability scheme



Conclusions and Outlook into the future

Conclusions

- NTM 51-10-32 / ANDT 51-94-23: New way of working established to harmonize UT shear waves inspections for multi-layered joint Al structures
- Increase thickness range
- Introduction of “All-in-One” Calibration Block

More efficiency and customer satisfaction

Outlook into the future

- Extension of the Technical Qualification to other materials and geometries
- Current on-going investigations:
 - Check different refracted angles (CEP18, CEP21 and CEP23) to be applied on all different step thicknesses
 - Comparison of search units. Check different frequencies and crystal sizes (CH51) to ensure same POD results
 - Check probes with different refracted angles for all step thicknesses and keeping the 8 MHz and same crystal size
- Development of PAUT technology for NTM 51-10-32 / ANDT 51-94-23

Questions & Answers

Thank you